

PUBLIC COMMENT SUBMITTAL
on
Model Water Efficient Landscape Ordinance
June 12, 2015 (Public Draft)

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Topic: 490. Purpose

Comment: On behalf of Rain Bird Corporation, thank you for your hard work over the past few months and your commitment to involving stakeholders throughout this emergency process, including the irrigation industry. Rain Bird believes saving water is a responsibility that we all share and we're completely committed to helping California achieve at least 25% water savings. We also support emergency regulations that encourage responsible water management practices, including updating the Model Water Efficient Landscape Ordinance (MWELO) and many of the changes proposed by the Department of Water Resources (DWR). We urge the adoption of widely accepted, proven means to reduce irrigation water use in new construction and significant renovations, while protecting the public's health, safety and welfare, especially during this time of emergency.

Topic: 490. (b) (1) Purpose

Comment: The purpose of including the term "transcend" is unclear and open to wide interpretation.

Rationale: Landscaping practices that "transcend the conservation and efficient use of water" is not clear. This seems to open up the purpose of the ordinance to limitless interpretation. It makes it difficult for industry and end-users to understand the purpose of the document and makes it less reliable as a guide for investment and decision-making.

Suggested Change (or Language):

- "(1) promote the values and benefits of landscaping practices that integrate and transcend the conservation and efficient use of water;"
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Topic: 491. (q) Definitions – ET Adjustment Factor

Comment: "ET Adjustment Factor" (ETAF) should not be changed in this time of emergency.

Rationale: ETAF is a function of Distribution Uniformity_{LH}, Irrigation Management Efficiency and Plant Factor. Irrigation Efficiency should be reconsidered outside of this emergency environment when it can be thoroughly considered, vetted and supported by science as noted below. Making the proposed change now without thorough examination seems to indicate that ETAF and its

components are arbitrary numbers to be used on a casual basis to ‘dial up or dial down’ the landscape water requirement. The opposite is true.

The current Model Ordinance has been used successfully by Rain Bird to guide investment in products to improve irrigation efficiency. Making an arbitrary, capricious change to ETAF without thoughtful consideration and intense public feedback would severely damage the good name, reputation and respect that MWELO has earned over its 25 year life and eliminate its water efficiency guidance to manufacturers, designers, installers, and maintenance personnel.

Making this arbitrary change is like one’s work supervisor demanding that one’s work performance get better while giving no indication of what is wrong, what steps should be taken, what the target is (beyond just ‘Get Better!’), how progress will be measured or a description of success. The desire on the part of the supervisor to improve is clear, but there is no evident path to success.

Suggested Change (or Language):

- Make no change to the definition of ETAF at this time and consider modifying it as part of the next formal update to MWELO which uses the full rule-making process.

Topic: 491. (bb) Definitions – Irrigation Efficiency

Comment: “Irrigation Efficiency” should not be changed in this time of emergency.

Rationale: Rain Bird is confused by the proposed change in Irrigation Efficiency from the current level of 0.71 to 0.85 for residential applications and 0.92 for commercial applications.

- a. It appears that DWR may have abandoned the Irrigation Efficiency (IE) definition and calculation that it researched and scientifically supported when it wrote the 2009 ETAF White Paper¹ in preparation for the 2010 changes to the Model Ordinance.
- b. Irrigation Efficiency quantifies water losses during irrigation. In the existing MWELO IE equation, the losses quantified are those due to lack of perfect uniformity of application and losses due to lack of perfect irrigation management.
- c. The White Paper carefully considered Irrigation Efficiency and supported its analysis with science. As a result, Rain Bird supports it. Irrigation Efficiency is set in the current the Model Ordinance at 0.71. The White Paper defines and calculates Irrigation Efficiency as follows:

$$IE = (DU_{LH})(IME)$$

Where $DU_{LH} = 0.79$ as described and supported in the White Paper, Section 6, and where IME is fixed by DWR at 0.90. This was based on the best information available at that time.

- d. So, using the numbers in the equation:

$$(0.79 DU_{LH})(0.90 IME) = 0.71 IE$$

¹ Appendix A – “ETAFWhite Paper012609”

- e. This is the source of the 0.71 Irrigation Efficiency set in the current Model Ordinance. Clearly, this was not an arbitrary number.
- f. Now, using the same White Paper equation, we can fill in the components in the proposed IE.

$$IE_{\text{Commercial}} 0.92 = DU_{\text{LH}} 1.02 \times \text{IME } 0.90$$

$$IE_{\text{Residential}} 0.85 = DU_{\text{LH}} 0.94 \times \text{IME } 0.90$$

- g. This is why it appears to Rain Bird that DWR has abandoned the White Paper definition and method of calculation of Irrigation Efficiency because using this equation with the proposed changes to Irrigation Efficiency yields a mathematically impossible result for DU_{LH} for commercial properties. The proposed residential Irrigation Efficiency yields a DU that is higher than is achievable by any combination of irrigation products on the market today. Clearly, this is not DWR's intent.
- h. It is possible that DWR is proposing an Irrigation Efficiency that was calculated by some other means. That means has not been communicated and the supporting material that justifies its use has also not been communicated. This leaves irrigation manufacturers no guidance on what level of DU_{LH} to work to achieve. It also leaves irrigation designers with no guidance on how to design systems to meet the requirement.
- i. DWR's proposed Commercial IE of 92% may be because the intent is for Commercial irrigation to only use Drip, Micro-spray and Sub-surface Irrigation. It is commonly believed that Drip Irrigation, et al, is more efficient due to low or no losses due to Wind Drift and Evaporation. However, Wind Drift and Evaporation are not factors included in the current calculation of Irrigation Efficiency. So, improvement in Irrigation Efficiency due to a factor that is not included in the calculation, theoretically, should not change the Irrigation Efficiency result. This change in Irrigation Efficiency leaves manufacturers, designers, installers, plan checkers, inspectors and maintenance personnel with no path to success and no description of success. It renders this part of the proposed MWELo unenforceable.
- j. Rain Bird believes that more thoughtful consideration is required before making changes to Irrigation Efficiency and it should be addressed in the next full revision of the ordinance.

Suggested Change (or Language):

- Make no change to the definition of Irrigation Efficiency at this time and consider modifying it as part of the next formal update to MWELo which uses the full rule-making process.

Topic: 491. (iii) Definitions – Recreational Area

Comment: Be more specific and inclusive of the actual playing surface of a golf course beyond the strict limits of tees, fairways, and greens.

Rationale: The playing surface of a golf course includes more than tees, fairways and greens for the average golfer. Even professional players find themselves in the 'rough' from time to time. The fairway is defined by the mowing height of the turf.

Similarly, greens and tees are surrounded by playing surface. Shots are played from the area surrounding tees and greens. These areas are called 'surrounds.' Shots are also played from the

rough, the area of turf that is mowed to a higher height commonly adjacent to the fairway. Shots from these areas are common as most players occasionally strike the ball incorrectly causing the ball to land in these areas. These areas are part of the playing surface of a golf course. Similar consideration should be given to the area surrounding the traps that frequent the area around a green. In addition, roughs are commonly located for safety and also provide buffer zones between the golf course and water sources making it more difficult for balls to roll into those bodies of water.

‘Rough’ is a term of art and not clearly defined as is the green and tee and they change over the life of the course. Giving consideration to the inclusion of roughs and surrounds in ‘Recreational Areas’ will ensure that the water management of this area conforms to best management practices and player safety.

Suggested Change (or Language):

- ~~“... amphitheaters or golf courses tees, fairways, and greens~~ those areas of golf courses that constitute playing surfaces, e.g., tees, greens, fairways, surrounds, and those areas of “rough” integral to the playability of the course.”

Topic: 492.4 (b) (1) Water Efficient Landscape Worksheet

Comment: The source of the ‘Plant Factor’ that must be used is confusing in the language.

Rationale: It is stated that “The plant factor used shall be from WUCOLS.” It then states that other sources may also be used. These two statements seem to conflict with each other. The word “shall” in the first statement seems to preclude other sources, but then other sources are allowed by the language that follows it.

Suggested Change (or Language):

- “The plant factor used shall be from WUCOLS. ~~Plant factors may also be obtained~~ or from horticultural researchers...”

Topic: 492.7 (a) (1) (A) Irrigation Design Plan. – Dedicated Landscape Water Meters

Comment: Rain Bird supports the requirement for dedicated water meters.

Suggested Change (or Language):

- No change

Topic: 492.7 (a) (1) (B) Irrigation Design Plan. – Smart Controllers

Comment: Rain Bird supports the change to require the use of smart controllers. Rain Bird also believes that the Model Ordinance should require the use of a Smart Controller that allows the user to set a maximum cycle time for each zone of the system. The requirement for non-volatile memory

should be changed to require a means of retaining programming, date and time in the event of a power outage.

Rationale: Smart Controllers have been proven to reduce water use when retrofitted onto a system that has been using more water than is required by the landscape. It automates the management of the system and is sensitive to the needs of the plants. This makes it comparable to the retrofitting of shower heads and toilets which require no change in user behavior to reduce water use.

Smart Controllers offer the opportunity to eliminate runoff using cycle and soak strategies as shown in research by California State Polytechnic University, Pomona.² Not all Smart Controllers allow the user to set a maximum cycle time regardless of the total run-time to meet the irrigation requirement. This additional requirement will eliminate runoff and obviate Precipitation Rate limits. Removing Precipitation Rate limits frees irrigators to use the full range of highly efficient irrigation solutions.

Rain Bird believes that all Smart Controllers on the market or that will be introduced to the market utilize non-volatile memory or some other means of preserving the programming, date and time during a power outage. The market demands this functionality. Although including this requirement for non-volatile memory would seem to ensure that this continues to be true, the harm caused by including it is the suppression of innovation and price reduction.

It should also be noted that non-volatile memory is unnecessary for computerized central control systems which recover automatically and completely from power outages.

Investment by manufacturers in discovering a better way to gain the same benefit may be discouraged, limiting innovation and hindering price reduction in Smart Controllers. Changing the language to require the functionality sought without confining solutions to the use of non-volatile memory would be a significant improvement in the language.

Suggested Change (or Language):

- “Automatic irrigation controllers that retain programming, date and time in the event of a power outage and utilize either evapotranspiration or soil moisture sensor data, ~~and non-volatile memory~~ include a means of limiting the cycle run time of each zone to eliminate runoff shall be required...”

Topic: 492.7 (a) (1) (C) Irrigation Design Plan. – Pressure Regulators

Comment: Rain Bird supports the requirement for equipment that ensures the water pressure design requirement is supplied to the irrigation devices. The proposed language is confusing.

Rationale: The proposed language in the first paragraph of (C) seems to suggest that only pressure regulators are required. However, paragraph (C) 1 makes clear the need for pumps when pressure is inadequate. This is somewhat confusing.

Suggested Change (or Language):

² Appendix E – “Appendix E - Rotary_Nozzles_and_Cycle_+_Soak”

- “The installation of a pressure regulator equipment is required to ensure that the dynamic pressure ...”

Topic: 492.7 (a) (1) (G) Irrigation Design Plan. – Flow Sensors

Comment: The requirement for a flow sensor in addition to a flow meter for all landscape irrigation systems is onerous for small landscapes. Rain Bird is the only manufacturer that offers high flow detection and response for large landscape systems using dedicated pumps and computerized central control systems.

Rationale: These flow sensors are expensive. They would be cost prohibitive on most residential systems and are less justified than they are on other, larger landscape applications.

The requirement for a flow sensor should be limited to residential landscapes 10,000 square feet and larger and all non-residential landscapes 5,000 square feet and larger. There are few times when a residence is unoccupied for long periods of time where the system could malfunction and go unnoticed. This justifies the larger threshold for residential compared to non-residential landscapes. Commercial properties are unoccupied for long periods of time and flow sensors would be more beneficial.

The requirement for both water meters **(492.7 (a) (1) (A) Irrigation Design Plan. – Dedicated Landscape Water Meters)** and flow sensors should be allowed to be met by a single piece of equipment. That should be explicit in the language of the ordinance to give guidance to designers, plan checkers and inspectors.

Rain Bird would enjoy a requirement of flow sensing on large landscapes with dedicated pumps and computerized central control systems due our dominance in that segment, however, the state may not find it in their best interest to do this.

Suggested Change (or Language):

- “Flow sensors that detect and react to high flow conditions created by system damage or malfunction are required for residential landscapes larger than 10,000 square feet in irrigated area and non-residential landscapes larger than 5,000 square feet in irrigated area. The requirement for a water meter and flow sensor may be combined in a single piece of equipment as long as the separate functions of both devices are satisfied by that combined equipment. Large landscapes with dedicated pump stations and computerized central control systems are exempt from this requirement.”

Topic: 492.7 (a) (1) (H) Irrigation Design Plan. – Master Valves

Comment: Rain Bird supports the requirement of master valves, with some limits.

Rationale: Master valves provide a valuable function in the case of main line or valve damage which would cause the continuous loss of water from the irrigation system. This value decreases with small landscapes which have a much smaller chance of main line damage and have fewer valves in the system.

To reduce the onerous nature of this requirement for small systems, Rain Bird suggests that the requirement for a master valve be limited to 500 square feet for non-residential systems and 2,500 square feet for residential systems. The rationale for the difference between residential and non-residential is that a resident is far more likely to notice a malfunction causing the loss of water from the irrigation system than on a non-residential system which may continue to fail throughout a weekend, for example.

Master valves are impractical to perform this function on some large landscape irrigation systems using dedicated pump stations and computerized central control systems. Grounds personnel on these large systems, especially on a golf course, commonly carry portable soil moisture sensors. When they suspect a critical part of the landscape (green) is stressing due to lack of water, they use their moisture sensor to verify this and then use a hose to spot water that area. If a master valve is installed on the system, water is not available to the hose connection. They then have to activate an entire zone or large rotor to spot treat a very small area. This also interrupts play on the golf course.

Rain Bird recommends that large landscape irrigation systems which have pump stations and computerized central control systems be exempt from the master valve requirement.

Suggested Change (or Language):

- “Master valves are required on all residential projects with irrigated areas greater than 2,500 square feet and on all non-residential projects with irrigated areas greater than 500 square feet with the following exception. Master valves are not required on large landscape systems with dedicated pump stations and computerized central control systems.”

Topic: 492.7 (a) (1) (M) Irrigation Design Plan. – Precipitation Rate Limit

Comment: Rain Bird believes that imposing a Precipitation Rate limit on an irrigation system will do little to help irrigation efficiency by delaying the start of runoff and will likely harm efficiency by increasing losses due to Wind Drift and Evaporation. Precluding the use of highly efficient irrigation products, including some applications of drip irrigation, based solely on an arbitrary precipitation rate limit is not supportive of the goals and objectives of the MWELO.

Rationale: The reason a Precipitation Rate limit is proposed is to reduce runoff waste. Runoff is the problem, not high Precipitation Rates.

Precipitation rate limits are not the best way or even a good way to reduce or eliminate runoff waste. Irrigation systems with 1 inch/hour Precipitation Rates apply water at a rate that far exceeds the Infiltration Rate of all non-manufactured soils. Therefore, runoff is not eliminated. Runoff will simply start a short time later compared to an irrigation system with, say, a 2.0 inch/hour Precipitation Rate. Cycle run times must be reduced in order to reduce runoff and precipitation rate limits alone do not address this at all. It is a faulty notion that prohibiting higher Precipitation Rate (but perhaps highly efficient) sprinklers will conserve water.

There are many, significant negative consequences to limiting precipitation rates.

- a. **Wind Drift and Evaporation:** Wind Drift and Evaporation are shown to be increased when using sprinklers with lower Precipitation Rates which tend to generate a greater proportion of smaller water droplets.

The Science: In a study conducted by University of Arizona³ and summarized in a White Paper by Randy Montgomery⁴ and in a presentation by Randy Montgomery at the Irrigation Association Trade Show and Conference in 2013⁵, it is shown that two spray sprinklers had very different performance in outdoor conditions despite having very similar performance in outdoor zero wind conditions. The more efficient sprinkler with a Precipitation Rate of 1.6 inches/hour applied 20% more of its water to the target area in a 5 mph wind compared to the sprinkler with a Precipitation Rate of 1.0 inch/hour.

More Science: A study conducted by California State Polytechnic University, Pomona⁶ found that 76 – 83% of runoff is due to wind, even at wind speeds of 0 – 5 mph. This study was performed with multi-stream, multi-trajectory nozzles.

- b. **Extended Run Times:** Low Precipitation Rate systems will extend the schedule run time needed to apply the budgeted amount of water. This causes more of the irrigation to happen during worsening wind conditions. The ideal time to irrigate is between 5:00 and 6:00 AM when wind speed in Los Angeles and San Diego, for example, at that time is approximately 1 – 2 mph.⁷ The average daily wind speed in those areas is 5 mph or higher⁸, the speed at which the low Precipitation Rate sprinkler in the University of Arizona study applied only about 63% of its water to the target area. The lower the Precipitation Rate limit imposed, the more irrigation will happen during windier times.
- c. **Restrictions on the use of Drip, Micro-spray and Sub-surface Irrigation:** Well-designed, efficient, Drip, Micro-spray and Sub-surface Irrigation systems sometimes have Precipitation Rates higher than 1.0 inch/hour. A limit of 1.0 inch/hour could eliminate from use some of these powerful water efficiency tools.
- d. **Restrictions on solutions for narrow strips:** The ordinance requires Sub-surface Irrigation for turf in areas less than 10 feet wide. This limits its application leaving few, less efficient choices to irrigate those functional areas.
- e. **Restrictions on solutions for overspray:** The ordinance prohibits overhead irrigation of turf within 2 feet of an impervious surface. Yet, it limits the use of Sub-surface Irrigation in those areas leaving a few, less efficient alternative means of irrigation.
- f. **Restrictions on solutions for large turf areas:** Many of the larger area turf sprinklers used to irrigate parks, schools, sports fields and golf courses would be eliminated from use. Many have Precipitation Rates higher than 1.0 inch/hour, especially when used in part circle operation. These rotors are the most efficient means of irrigating these spaces. Sprinklers in golf course playing surfaces would often have to be full-circle sprinklers located near the

³ Appendix B - Final Rainbird Report Apr 2013 Brown Gilbert

⁴ Appendix C – “Wind Effects on Sprinkler Irrigation Performance – Randy Montgomery”

⁵ Appendix D – “Let’s Take It Outside – How Much Does Wind Effect Efficiency? Randy Montgomery IA 2013 Presentation”

⁶ Appendix E – “Appendix E - Rotary_Nozzles_and_Cycle_+_Soak”

⁷ <https://weatherspark.com>

⁸ <http://www.ncdc.noaa.gov/sites/default/files/attachments/wind1996.pdf>

edge in order to provide adequate water to the turf. This would cause excessive overspray onto non-playing surfaces where it has less beneficial use.

There is existing, affordable technology on the market today from several manufacturers that eliminates runoff waste.

- a. The most effective solution to eliminating runoff waste is to break irrigation run times into short cycles that stop before runoff begins, pausing irrigation to allow water to soak in and then repeating the pattern until the irrigation requirement is met. There are products on the market today that accomplish this with no user intervention or change in user behavior.
- b. The Science: The study conducted at California State Polytechnic University, Pomona⁹ showed that using short cycles and soak times resulted in reducing runoff to about 0.25% of total water applied when using high and low precipitation rate sprinklers. In other words, 99.75% of the water applied did not runoff regardless of the sprinklers' Precipitation Rate when proper Irrigation Management was employed. This can be accomplished automatically with no user intervention or change in behavior. The low precipitation rate sprinklers used in the study were multi-stream, multi-trajectory nozzles and conventional, fan spray heads.

Automation with Available Products:

Irrigation controllers on the market today from several manufacturers allow the user to limit cycle time to eliminate runoff. The only expertise required is during the installation and set-up time. This level of expertise is reasonable to expect. Products can be chosen that require no change in end-user behavior.

Conclusions:

1. Lower Precipitation Rates will only delay the start of runoff and not eliminate it because no soil aside from manufactured putting greens and manufactured sports fields can absorb water at the rate of 1.0 inch/hour.
2. Imposing Precipitation Rate limits ignores the very significant water waste due to Wind Drift and Evaporation losses that tend to increase as Precipitation Rate is lowered.
3. Even low Precipitation Rate sprinklers require management via the controller to eliminate runoff due to the infiltration rate of the soil, so why deny Californians the right to use the most efficient irrigation solutions possible? The benefits of a Precipitation Rate limit are greatly overshadowed by the negative consequences.
4. Irrigation Management strategies have been shown in university research to completely eliminate runoff regardless of the Precipitation Rate of the sprinklers used.
5. Products on the market today make the employment of Irrigation Management strategies that completely eliminate runoff easy for the end-user and require only reasonable expertise on the part of the installer. The proposed changes to the ordinance now require a "Smart Controller." Adding a requirement that it allow the user to set a maximum cycle time per zone as suggested above would solve the problem of runoff.

⁹ Appendix E – "Appendix E - Rotary_Nozzles_and_Cycle_+_Soak"

6. Science supports these conclusions.
7. Do not settle for a partial, weak, ineffective measure to only reduce runoff while harming irrigation water efficiency.

Suggested Change (or Language):

- “(M) The irrigation system must be designed and installed in such a manner that a precipitation rate of 1.0 inches per hour is not exceeded in any portion of the landscape runoff and erosion are prevented. A design or technology, specified in the Landscape Documentation Package, shall be used that clearly demonstrates no runoff or erosion will occur. Prevention of runoff and erosion must be confirmed during the irrigation audit.”
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Topic: 492.13 (a) Irrigation Efficiency

Comment: The proposed changes are confusing and damage the guidance given in the current MWEL.

Rationale: Please refer to the rationale above in section 491. (bb) Definitions – Irrigation Efficiency During the process to make long term changes to the Model Ordinance, outside of this emergency environment, change the Irrigation Efficiency calculation method to include Wind Drift and Evaporation losses. Consider also at that time other possible changes in irrigation technology and knowledge that may have occurred since the last revision to the Model Ordinance in 2010.

Suggested Change (or Language):

- Make no change to Irrigation Efficiency in the Model Ordinance during this time of emergency. Time constraints seem to have resulted in proposed changes that are unattainable.
-